Water Plan Update 2013
California Water Sustainability Indicators Framework

INDICATORS CATEGORIZED BASED ON DOMAINS

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Indicators categorized based on the following five domains:

WSR – Water Supply Reliability

WQ – Water Quality

EH - Ecosystem Health

ASM – Adaptive and Sustainable Management

SBE – Social Benefits and Equity

WSR – Water Supply Reliability

The following indicators have been suggested for Water Supply Reliability (WSR). These consider the availability or provision of water of sufficient quantity and quality to meet water needs for health and economic well-being and functioning. Full descriptions of the indicators may be found in the Indicators Framework Appendix D.

1. Amount of Delta water used by sector (urban, agriculture, municipal, industrial) per season and per year

2. Annual withdrawal of ground and surface water as a percent of total annually renewable volume of freshwater

3. Drought resilience: the maximum severity of drought during which core water demands can still be met, including social and environmental minimum requirements

4. Earthquake resilience: the maximum earthquake intensity that can occur without causing more than $20 million in damages due to water infrastructure disruptions, including levees

5. Energy required per unit of clean water sourced, treated, delivered, used, and again treated

6. Industrial production dependent on Delta water/region per year

7. Number of acres protected or enhanced in aquifer recharge areas

8. Number of basins with years-long aquifer declines (known as overdraft) or projected future declines

9. Percent likelihood per year, over the next 20 years, of water shortage, calculated using 1) up-to-date, climate-sensitive forecasts of precipitation, evapotransporation, and streamflow and 2) all water uses, including environmental uses such as instream flows and reversing overdrafted basins, and required uses such as treaty-obligated water

10. Percent of drinking water suppliers which have instituted an affordable "lifeline" rate for low-income residential customers

11. Percentage of state and regional water supplied by the Delta

12. Proportion of agricultural non-potable water needs--e.g. irrigation--met with non-potable water

13. Proportion of watershed covered with impervious surfaces, including pavement, buildings, and turf grass.

14. Residential outdoor water use per year per capita, 20% reduction by 2020 (per state law)

15. Storm resilience: the maximum storm intensity that can occur without causing more than $10 million in damages due to water infrastructure disruptions, including levees and floods

16. Total agricultural, residential, and commercial water demand, i.e. demand for all uses other than environmental needs and basic human drinking water requirements

17. Use of recycled water as a percent of total water used in the Delta region

18. Use of recycled water as a percent of total water used

19. Volume of water re-used (same volume can count more than once) as a fraction of total water used, including onsite, recycled at a plant

20. Water miles, distance traveled for units of water used

21. Water miles; Distance traveled for units of drinking and irrigation water

22. Water Scarcity Index

23. Water Stress Index

24. Water use per year inside the home per capita, 20% reduction by 2020 (per state law)

25. Years of average water use represented by the current volume of water stored in available groundwater, reservoirs, imports, expected precipitation, and snowpack

WQ – Water Quality

The following indicators have been suggested for Water Quality (WQ). These characterize the chemical and physical quality of water to meet ecosystem and drinking water standards and requirements. Full descriptions of the indicators may be found in the Indicators Framework Appendix D.

1. Proportion of watershed covered with impervious surfaces, including pavement, buildings, and turf grass

2. Number of people whose drinking water supply is unhealthy

3. Rate of Fertilizer Applied (kg/ha)

4. % of irrigated lands that meet water quality standards in Delta Region

5. Pollutant and bacteria index

6. Rate of fertilizer applied (kg/ha)

7. Tons of industrial pollutants released and disposed of by watershed/region

8. Surface water quality index

9. Groundwater quality index

EH - Ecosystem Health

The following indicators have been suggested for Ecosystem Health (EH). These characterize the conditions of the natural system, including terrestrial systems interacting with aquatic systems through runoff pathways. Full descriptions of the indicators may be found in the Indicators Framework Appendix D.

1. Acres of preservation of existing natural habitats and restoration of degraded habitats

2. Aquatic Fragmentation in a watershed or aquatic region

3. Channel alteration (artificial change)

4. Ecosystems and species under serious risk from unnatural fire frequencies

5. Extent of floodplain restoration and connection between channel and floodplain (number of acres restored by type of habitat: floodplain, riparian, marsh, etc)

6. Flow pattern variability / alteration (both important seasonally and annually)
7. Flow patterns and alterations

8. Forest land conversion: Total acreage over time

9. Increased measurable benefit in in-stream flows from water recycling and conservation

10. Index of Biotic Integrity

11. Magnitude and timing of managed system flows suitable for native riparian habitats and geomorphic processes

12. Mercury in fish tissue

13. Number of conservation and restoration projects

14. Percent impervious area within 200 m of waterway, or Inverse-distance-weighted impervious cover

15. Percent riparian buffer

16.Periphyton cover and biomass

17. Potential runoff from urban impervious areas

18. Proportion of watershed covered with impervious surfaces, including pavement, buildings, and turf grass

19. Quantity and timing of managed flows to support natural geomorphic processes

20. Ratio of observed to expected native species (fish and benthic macroinvertebrate species)

21. Relative Abundance trend of key indicator species at different life stages (i.e. Delta smelt, Longfin smelt, juvenile striped bass, Chinook salmon, all salmonid populations)

22. Relative abundance trend of key non-native species (e.g. Brazilian waterweed (Egeria densa) and water hyacinth (Eichhornia crassipes)), and harmful invasive species (Microcystis aeruginosa (HAB- harmful algal blooms)

23. Species richness (birds, fish, invertebrates)

24. Stream bank stability

25. Sufficient and adequate flows for maintaining historically-present native fish

26. Sufficient flows and timing of flows for maintaining historically-present native fish

27. Sufficient flows and timing of managed system flows suitable for native riparian habitats

28. Sufficient flows for maintaining historically-present native fish

29. Trophic State Index

30. Urban forest (% TREE canopy cover in urban areas)

ASM – Adaptive and Sustainable Management

The following indicators have been suggested for Adaptive and Sustainable Management (ASM). ASM is a management system that can nimbly and appropriately respond to changing conditions and that is equitable and representative of the various needs for water in CA. Full descriptions of the indicators may be found in the Indicators Framework Appendix D.

1. Building standard and/or cost of maintaining levees/assess value of the land use they protect

2. Collaboration between scientists and policy makers to understand data and communication needs

3. Communication of uncertainty

4. Cost of water treatment

5. Data sharing and distribution

6. Energy required per unit of clean water sourced, treated, delivered, used, and again treated

7. Equitable decision-making process for water management, diversity of participating organizations

8. Flood resilience: the maximum flood that can be experienced without exceeding $10 million in damages

9. Flow chart of process from data need, collection, analysis, political action, implementation, and results

10. Frequency of levee breaks in the region

11. Greenhouse gas emissions

12. Investment in agricultural improvement for water management and quality in Delta region

13. Land subsidence (absolute amount and rate)

14. Levee System Integrity Index (stability, risk prevention, maintenance)

15. Participation rates in local stewardship by the local stakeholders such as municipalities, indigenous people, irrigation districts, community organizations, watershed associations, conservation groups, and stewardship groups

16. People's level of support or opposition to environmental regulations (e.g., support for statewide bonds, support for local environmental regulations)

17. Process/data needs of local jurisdictions and environments

18. Proportion of streams monitored at least every 5 years for stream-flow, temperature, fisheries, stability.

19. Public awareness of source water protection issues

20. Public reporting system for data and results of analysis as well as methods used

21. Standardized methods for data collection and reporting and minimize collection biases

22. Supports adaptation and resilience to climate change

23. The completion of restoration recommendations and key actions during the implementation phase of the process

24. Water miles, distance traveled for units of water used

SBE – Social Benefits and Equity

The following indicators have been suggested for Social Benefits and Equity (SBE). These characterize the health, economic, and equity benefits realized from a well-managed water system, including management of water withdrawal and water renewal. Full descriptions of the indicators may be found in the Indicators Framework Appendix D.

1. Building standard and/or cost of maintaining levees/assess value of the land use they protect

2. Correlation between quality and quantity of available drinking water and household income

3. Cumulative hydrostatic force

4. Equitability of benefit realization for local economies in water-source and water-receiving regions due to water transfer

5. Equitable decision-making process for water management, diversity of participating organizations

6. Equitable distribution of economic and health benefits from water management

7. Expected annual damage for flood risk

8. Fiscal cost and benefit for local economy in water-source region due to water transfer

9. Job-equivalents per unit of water transferred from a source region (e.g., agricultural labor force)

10. Mercury in fish tissue

11. Number of people whose drinking water supply is unhealthy

12. Percent of drinking water suppliers which have instituted an affordable "lifeline" rate for low-income residential customers

13. Proportion of floodplain that is protected from development that is incompatible with flooding

14. Public reporting system for data and results of analysis as well as methods used

15. Sport and subsistence fishing use in the Delta (number of licenses issued/active per year)

16. Trend in recreational use index (visitor days, boating days, camping site occupancy, picnic site occupancy) in the Delta region